SOLVAY
SODA ASH JOINT VENTURE

June 24, 1997

Bernie Dailey
WDEQ-Air Quality Division
122 West 25th Street
Cheyenne, WY 82002

RE: Air Quality Permit Application AP-W77

Dear Bernie:

This letter is in reply to your questions concerning Solvay Soda Ash Joint Venture's (SSAJV) Air Quality Permit Application AP-W77.

LIFTERS:
The existing calciners are equipped with lifters, dams, and cells to increase heat transfer efficiency. The proposed expansion calciner (AQD #80) will also be equipped with lifters, dams, and cells.

MINERS:
The borer miners in use at the SSAJV mine do not allow for adjustable height. However, the trona seam currently being mined is approximately 12 feet thick. The miner mines a thickness of 9 feet, leaving a layer of trona both on the roof and the floor, avoiding mining the underlying and overlying oil shale. It is advantageous, not only from an environmental perspective, but also for safety and operational reasons to avoid mining the shale. For conventional room and pillar mining in which the roof is bolted for support after mining has taken place, the roof is more stable when a layer of trona is left. As for operations, the hauling, processing, and disposing of the shale is extremely uneconomical, and causes upsets during the processing of the trona. There are organics inherent in the ore body itself, which are processed with the trona. By 1999, SSAJV will install a longwall mining system with the ability to adjust the height from 7 to 10 feet. Again, the miner will avoid extracting oil shale as much as reasonably possible. This miner will not replace the existing borer miners, it is an additional continuous mining system.

NO$_X$:
In reviewing North American Mfg. Co.'s (NAMCo) emission estimates of the Magna Flame LE burner installed on AQD #s 17 and 48, it was noted that at the higher temperature (2600° F) required to run the unit at its design capacity of 200 MM Btu/hr, the emission rate will be 0.06 lb NO$_X$/MM Btu, rather than the 0.05 lb NO$_X$/MM Btu rate at lower firing rates (2400° F burner temperature). Through testing the unit at design

capacity, it has been shown that the unit does perform at approximately 0.06 lb NO_X/MM Btu, as NAMCo guarantees. At 0.06 lb NO_X/MM Btu, the revised PPH NO_X emission rates of AQD #s 17 and 48 will be 15 and 30 PPH (65.7 and 131.4 TPY), respectively.

- BACT: The NAMCo Magna Flame LE Burners installed on AQD #s 17 and 48 are the lowest NO_X emitting burners currently installed on a calciner in the trona industry. No other burner appropriate for a trona calciner has been commercially demonstrated with lower NO_X emissions. Since installation of the existing burners, NAMCo has made further improvements to the design of the Magna Flame LE Burner. These changes will allow the newer burner design, which will be installed on the proposed expansion calciner (AQD #80), to be rated at 0.05 lb NO_X/MM Btu, at the design firing rate of 400 MM Btu/hr.

- AMBIENT IMPACT: The ambient impacts due to the increase in expected NO_X emissions at the 0.06 lb NO_X/MM Btu rating have been assessed, as noted in the revised tables below. Copies of this information are enclosed on computer disk.

Table 6-1: Maximum Impacts from Emissions Due to Expansion - Revision 1

Pollutant	Averaging Period	Year	Modeled Impacts ($\mu g/m^3$)	Significant Impact Level ($\mu g/m^3$)	de minimis Monitoring Level ($\mu g/m^3$)
NO_X	Annual	1987	1.51	1	14
		1988	1.86	1	14
		1989	1.6	1	14
		1990	1.42	1	14
		1991	1.50	1	14

Table 6-2: NAAQS/WAAQS Compliance Demonstration - Revision 1

Pollutant	Averaging Period	Year	SSAJV Impact (HSH) ($\mu g/m^3$)	Monitored Impact ($\mu g/m^3$)	Cumulative Impact ($\mu g/m^3$)	AAQS ($\mu g/m^3$)
NO_X	Annual	1987	33.1	3	36.1	100
		1988	37.0	3	40.0	100
		1989	38.2	3	41.2	100
		1990	36.3	3	39.3	100
		1991	40.1	3	43.1	100

Table 6-7: Summary of Maximum Acid Deposition Results - Revision 1

Name	Annual Modeled NO_X Impact ($\mu g/m^3$)	Lake Baseline ANC ($\mu eq/L$)	Δ ANC (Percent)	Δ pH
Black Joe Lake	0.00131	46	0.728	0.0032
Deep Lake	0.00137	40	0.875	0.0038
Hobbs Lake	0.00099	57	0.444	0.0019
Ross Lake	0.00074	51	0.371	0.0016
Saddlebag Lake	0.00152	28.4	1.367	0.0060
Klondike Lake	0.00084	20	1.073	0.0047
Upper Titcomb Lake	0.00091	34	0.684	0.0030

NOTE: These results do not take into account the PSD netting of NO_X emissions.

EXHAUST VOLUMES (SCFM):
The standard cubic feet per minute (scfm) exhaust volumes of the proposed sources were reported in the permit application at conditions of 32° F and 29.92 inches Hg. Per Wyoming Air Quality Standards and Regulations Chapter 1 Section 2(a)(xxxviii), standard conditions are defined as 68° F and 29.92 inches Hg. The scfm exhaust volumes have been recalculated at 68° F and are noted in the table below:

AQD #	scfm
74	4,025
75	4,025
76	43,500
77	2,625
78	3,225
79	2,425
80	138,400
81	20,600
82	75,500
83	3,360
84	6,975

6. RESULTS

6.1 IMPACTS DUE TO EXPANSION

As part of the modeling analysis, just those impacts from the proposed expansion are compared with de minimis monitoring levels and significant impacts levels (SILs). Impacts greater than the de minimis monitoring levels indicate the need for preconstruction monitoring data to be collected (or a reasonable substitute to be available). If impacts are shown to be above the SILs then a cumulative impact analysis is required to demonstrate compliance with the NAAQS, WAAQS, and PSD increment.

Table 6-1 presents the modeling results for impacts due to emissions from the facility expansion. Maximum impacts for each averaging period is shown in this table. Figures 6.1 and 6.2 depict isopleths of the PM_{10} dispersion modeling results on an annual and 24 hour basis, respectively.

Table 6-1: Maximum Impacts from Emissions Due to Expansion

Pollutant	Averaging Period	Year	Modeled Impacts ($\mu g/m^3$)	Significant Impact Level ($\mu g/m^3$)	de minimis Monitoring Level ($\mu g/m^3$)
PM_{10}	24-hour	1987	28.9	5	10
		1988	36.8	5	10
		1989	30.4	5	10
		1990	34.7	5	10
		1991	33.1	5	10
	Annual	1987	7.9	1	
		1988	8.6	1	
		1989	8.3	1	
		1990	7.5	1	
		1991	8.8	1	
CO	1-hour	1987	855	2000	
		1988	902	2000	
		1989	985	2000	
		1990	836	2000	
		1991	805	2000	
	8-hour	1987	195	500	575
		1988	274	500	575
		1989	240	500	575
		1990	249	500	575
		1991	261	500	575

Table 6-1 (Continued)

Maximum Impacts from Emissions Due to Expansion

Pollutant	Averaging Period	Year	Modeled Impacts ($\mu g/m^3$)	Significant Impact Level ($\mu g/m^3$)	de minimis Monitoring Level ($\mu g/m^3$)
SO_2	3-hour	1987	0.089	25	
		1988	0.110	25	
		1989	0.130	25	
		1990	0.110	25	
		1991	0.120	25	
	24-hour	1987	0.021	5	13
		1988	0.020	5	13
		1989	0.021	5	13
		1990	0.020	5	13
		1991	0.022	5	13
	Annual	1987	0.0034	1	
		1988	0.0037	1	
		1989	0.0038	1	
		1990	0.0033	1	
		1991	0.0039	1	
NO_x	Annual	1987	1.42	1	14
		1988	1.75	1	14
		1989	1.51	1	14
		1990	1.34	1	14
		1991	1.41	1	14

replaced in letter dated 6/24/97 (handwritten)

Modeled CO impacts due to the expansion, are below both the SILs and the de minimis monitoring levels. Therefore, no further analyses are required for CO.

Modeled PM_{10} impacts exceed both the SIL and de minimis levels. The preconstruction monitoring requirement for PM_{10} will be met by using the existing PM_{10} monitoring network at the SSAJV facility. AAQS and PSD increment compliance is demonstrated below.

6.2 AAQS COMPLIANCE ASSESSMENT

Those pollutants which show impacts in excess of the SILs are included in a cumulative AAQS compliance demonstration. As discussed in Section 5, modeled high-second high impacts for the entire SSAJV facility (existing and expansion sources) are combined with monitored background levels for comparison with the NAAQS and the WAAQS. Only PM_{10} and NO_X impacts were required to be included in this analysis. The results of this analysis are shown in Table 6.2.

Table 6-2: NAAQS/WAAQS Compliance Demonstration

Pollutant	Averaging Period	Year	SSAJV Impact (HSH) ($\mu g/m^3$)	Monitored Impact ($\mu g/m^3$)	Cumulative Impact ($\mu g/m^3$)	AAQS ($\mu g/m^3$)
PM_{10}	24-hour	1987	24.6	34	58.6	150
		1988	29.1	34	63.1	150
		1989	28.1	34	62.1	150
		1990	28.4	34	62.4	150
		1991	27.7	34	61.7	150
	Annual	1987	7.9	11	18.9	50
		1988	8.6	11	19.6	50
		1989	8.3	11	19.3	50
		1990	7.5	11	18.5	50
		1991	8.8	11	19.8	50
NO_x	Annual	1987	32.9	3	35.9	100
		1988	36.8	3	39.8	100
		1989	38.1	3	41.1	100
		1990	36.2	3	39.2	100
		1991	40.0	3	43.0	100

replaced in letter dated 6/24/97

6.3 PSD INCREMENT ANALYSIS

Those pollutants with PSD Increments that have modeled impacts that exceed the SILs (PM_{10}) are included in the PSD Increment Analysis. The increment analysis includes all sources permitted after the PSD baseline was triggered. This includes all of the SSAJV facility. The results of this analysis are shown in Table 6.3.

Table 6-3: Class I PSD Increment Analysis

Pollutant	Averaging Period	Year	SSAJV Impact (HSH) ($\mu g/m^3$)	PSD Class II Increment ($\mu g/m^3$)
PM_{10}	24-hour	1987	24.6	30
		1988	29.1	30
		1989	28.1	30
		1990	28.4	30
		1991	27.7	30
	Annual	1987	7.9	17
		1988	8.6	17
		1989	8.3	17
		1990	7.5	17
		1991	8.8	17

6.4 HAPS

1-hour, 8-hour, 24-hour, and annual impacts for all hazardous air pollutant (HAP) emissions from the SSAJV facility are shown in Table 6-4. These results are compared with the highest and lowest allowable ambient levels (AALs) presented in Section 5, Tables 5-3 and 5-4. Table 6-5 depicts the status of the levels. As can be seen, the result of most HAPs are below the lowest AALs for all of the states. For some HAPs and some averaging periods, the modeled results are greater than the lowest AALs, but below the highest AALs.

The calculated risk of the HAPs that are considered carcinogens are shown in Table 6-6. The maximum estimated risk is that of 1,3 Butadiene at 7.56×10^{-5} or 76 chances in a million.

Table 6-4: Summary of HAP Modeling - Five Year Maximum Impact

(1987 - 1991 Rock Springs Meteorological Data)

	5-Year Maximum Impacts ($\mu gm/m^3$)			
	1-hour	8-hour	24-hour	Annual
ACETALDEHYDE	0.48	0.15	0.077	0.0071
ACETONE	0.33	0.1019	0.057	0.0050
ACETOPHENONE	0.032	0.010	0.0052	0.00048
ACROLEIN	1.23	0.37	0.20	0.018
*ACRYLONITRILE	1.52	0.46	0.26	0.023
BENZENE	25.29	7.72	3.97	0.37
BIPHENYL	0.046	0.014	0.0073	0.00068
BIS(2-ETHYLHEXYL)PHTHALATE	0.0030	0.00092	0.0005	0.00004
1,3 BUTADIENE	18.55	5.66	2.88	0.27
2-BUTANONE	4.74	1.45	0.82	0.072
2-CHLOROACETOPHENONE	0.0030	0.00092	0.0005	0.00004
CUMENE	0.004	0.0011	0.0006	0.00005
DI-N-BUTYLPHTHALATE	0.023	0.0071	0.0037	0.00034
DIBENZOFURAN	0.039	0.012	0.0062	0.00058
ETHYL BENZENE	2.51	0.76	0.42	0.038
FORMALDEHYDE	0.34	0.11	0.059	0.0050
HEXANE	7.85	2.40	1.24	0.116
*METHYLENE CHLORIDE	1.10	0.33	0.16	0.016
3/4 METHYLPHENOL	0.019	0.0058	0.0031	0.00028
N,N-DIMETHYLANILINE	0.016	0.0049	0.0026	0.00024
NAPHTHALENE	0.30	0.09	0.048	0.0044
PHENOL	0.18	0.056	0.029	0.0027
PROPIONALDEHYDE	0.14	0.042	0.022	0.0021
STYRENE	4.59	1.40	0.72	0.068
TOLUENE	10.47	3.19	1.69	0.156
*1,1,1-TRICHLOROETHANE	8.85	2.70	1.31	0.129
*TRICHLOROETHENE	9.11	2.84	1.57	0.135
XYLENE	13.87	4.23	2.25	0.207

* These four compounds may have been misidentified during

the GC stack test, the more accurate GC/MS did not identify these

compounds. However, they have been included in the permit analysis.

Table 6-5: Summary of HAP Modeling - Status of Modeled Values vs. State Regulations

	Status			
	1-hour	8-hour	24-hour	Annual
ACETALDEHYDE	Below	Below	Below	Below
ACETOPHENONE	Below	N/A	Below	Below
ACROLEIN	Below	Below	Below	Between
*ACRYLONITRILE	Below	Below	Below	Between
BENZENE	Below	Below	Between	Between
BIPHENYL	Below	Below	Below	Below
BIS(2-ETHYLHEXYL)PHTHALATE	Below	Below	Below	Below
1,3 BUTADIENE	Between	Below	Between	Between
2-BUTANONE	Below	Below	Below	Below
CUMENE	Below	Below	Below	Below
ETHYL BENZENE	Below	Below	Below	Below
FORMALDEHYDE	Below	Below	Between	Between
HEXANE	Below	Below	Below	Below
*METHYLENE CHLORIDE	Below	Below	Below	Below
NAPHTHALENE	Below	Below	Below	Below
PHENOL	Below	Below	Below	Below
PROPIONALDEHYDE	Below	Below	N/A	N/A
STYRENE	Below	Below	Below	Below
TOLUENE	Below	Below	Below	Below
*1,1,1-TRICHLOROETHANE	Below	Below	Below	Below
*TRICHLOROETHENE	Below	Below	Below	Below
XYLENE	Below	Below	Below	Below

* These four compounds may have been misidentified during the GC stack test, the more accurate GC/MS did not identify these compounds. However, they have been included in the permit analysis.

Table 6-6: Calculated Risk

HAP Pollutant	Unit Risk Factor	Maximum Modeled Annual Concentration ($\mu g/m^3$)	Calculated Risk
*Acrylonitrile	6.8×10^{-6}	0.023	1.56×10^{-7}
Benzene	8.3×10^{-6}	0.37	3.07×10^{-6}
Bis(2-Ethylhexyl)phthalate	2.4×10^{-7}	0.00004	9.6×10^{-12}
1,3 Butadiene	2.8×10^{-4}	0.27	7.56×10^{-5}
Formaldehyde	1.3×10^{-5}	0.005	6.5×10^{-8}
*Methylene Chloride	4.1×10^{-6}	0.016	6.56×10^{-8}
*Trichloroethene	1.3×10^{-6}	0.135	1.76×10^{-7}

* These compounds may have been misidentified during stack testing utilizing the GC, the more accurate GC/MS results have not revealed these HAPs. However, they have been included in the permit analysis.

6.5 Plume Visibility

One of two ways to measure the effects of air emissions on visibility is to determine the perceptibility of the plume at a Class I Area. The EPA's VISCREEN model is used to determine plume perceptibility using two criteria: plume perceptibility (delta E) and plume contrast. These parameters are calculated by VISCREEN for vistas looking inside the Class I Area and looking outside the Class I Area. For this analysis, these criteria are only assessed inside the Class I Area. The VISCREEN model was used with the following inputs:

- 812 tons per year particulate emissions,
- Background Visual Range of 262 kilometers,
- Source Observer distance of 130 kilometers,
- Minimum Distance of 130 kilometers, and
- Maximum Distance of 145 kilometers.

An initial Level One analysis (using worst-case meteorological conditions) did not show compliance with the screening criteria used by VISCREEN.

Following the guidance in the EPA's Tutorial Package for the VISCREEN Model, the five-year meteorological data set was analyzed to determine what meteorological conditions should be used in the Level Two analysis. In addition, as recommended in the Tutorial Package, stabilities were shifted one level less stable (i.e. D was changed to C) to account for the elevation change between the source and the Class I Area. The Level Two analysis did show compliance with screening criteria for visual impacts inside the Class I Area.

6.6 Regional Haze

The condensible emission rates were added to PM_{10} emission rates and input to the ISCST3 model and modeled to the Class I Bridger Wilderness. Visibility impairment due to regional haze was calculated based on the IWAQM guidance. The maximum concentration of organic aerosol modeled at the wilderness boundary was reported as 0.067 $\mu g/m^3$, based on the ISCST3 model. Based on the WDEQ/AQD's continuing review of visibility data and the IMPROVE monitoring calculations, the maximum visibility impairment was calculated to be 0.18 deciviews. Based on the review, the proposed project will not significantly impact visibility in the Bridger Wilderness. The conclusion is made as the predicted deciview change is less than 0.5 deciviews.

6.7 Acid Deposition

A screening level assessment of acid deposition impact is typically performed using a technique presented by Fox (1983). This technique quantitatively estimates the change in pH on a sensitive water body (i.e., mountain lake) by incorporating predicted ambient

concentrations of SO_2 and NO_2. In addition, the conversion of predicted NO_2 concentrations from the SSAJV facility to applicable nitrate deposition values for use in the Fox technique was performed according to the procedures present on page 5-6 of the previously cited IWAQM document. Since the SO_2 emissions from the SSAJV facility will be minimal, evaluating impacts from resulting sulfate deposition is not necessary. The predicted NO_2 impacts from the SSAJV expansion at representative water bodies (Table 5-8) were analyzed. The PSD netting of NO_x was not taken into account for this analysis. NO_2 impacts were obtained by using the ISC model. The lakes were chosen for analysis as recommended by Ann Mebane of the US Forest Service in Pinedale.

The acid deposition results are presented in Table 6-7. The total potential loss of ANC, in μeq/L, by SSAJV expansion emissions was compared to the baseline for each lake. The resultant percent change was then compared to significance criteria such as 10 percent for waterbodies with baseline ANC's between 25-100 μeq/L or the even more stringent significance criterion of 1 percent which is the 10 percent criterion value divided by a safety factor of 10.

The change in pH from the nitrate deposited into the sensitive lakes was also estimated. These results are also presented in Table 6-7. The significance criterion for change in pH is typically 0.10 with some cited values up to 0.50.

Table 6-7: Summary of Maximum Acid Deposition Results

Name	Annual Modeled NO$_x$ Impact (μg/m^3)	Lake Baseline ANC (μeq/L)	Δ ANC	Δ pH
Black Joe Lake	0.00118	46	0.655	0.0029
Deep Lake	0.00124	40	0.792	0.0035
Hobbs Lake	0.00086	57	0.386	0.0017
Ross Lake	0.00067	51	0.0336	0.0015
Saddlebag Lake	0.00138	28.4	1.242	0.0054
Klondike Lake	0.00076	20	0.971	0.0042
Upper Titcomb Lake	0.00082	34	0.616	0.0027

NOTE: These results do not take into account the PSD netting of NO$_x$ emissions.

→ *replaced in letter dated 6/24/97*